Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

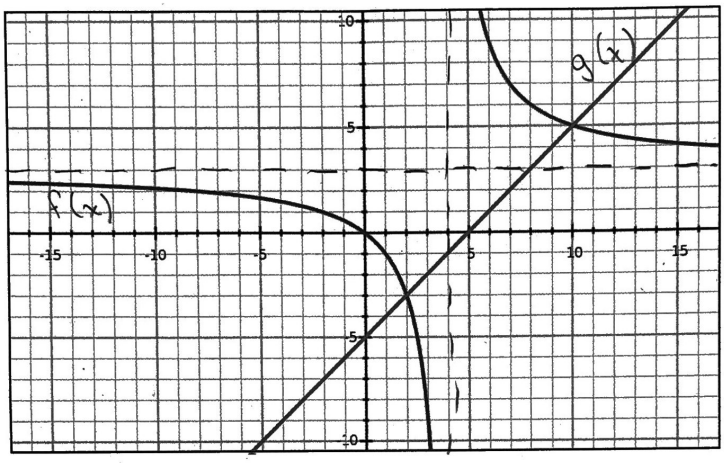
Directions:

Solve each problem as asked. **Read** the question and **answer** the question asked. **Show all of your work.** Any work shown for multiple-choice questions can earn you partial credit for that problem if I understand how you arrived at your answer.

Please **box your answer** for each problem.

1) Look at the graph below.

a. Find the equation of the two functions below. (4pts each)



$g(x) = x - 5$

$y = \frac{a}{x-h} + k$

$y = \frac{a}{x-4} + 3$

$0 = \frac{a}{0-4} + 3$

$0 = \frac{a}{-4} + 3$

$-3 = \frac{a}{-4}$

$12 = a$

$f(x) = \frac{12}{x-4} + 3$

b. Then find the **solutions to the system of the two equations**. You must **show how you arrived at your solution algebraically** in order to earn credit for this question. (5pts)

$\frac{12}{x-4} + 3 = x - 5$

$x - 4\left(\frac{12}{x-4} = x - 8\right)$

$12 = (x-4)(x-8)$

$12 = x^2 - 12x + 32$

$0 = x^2 - 12x + 20$

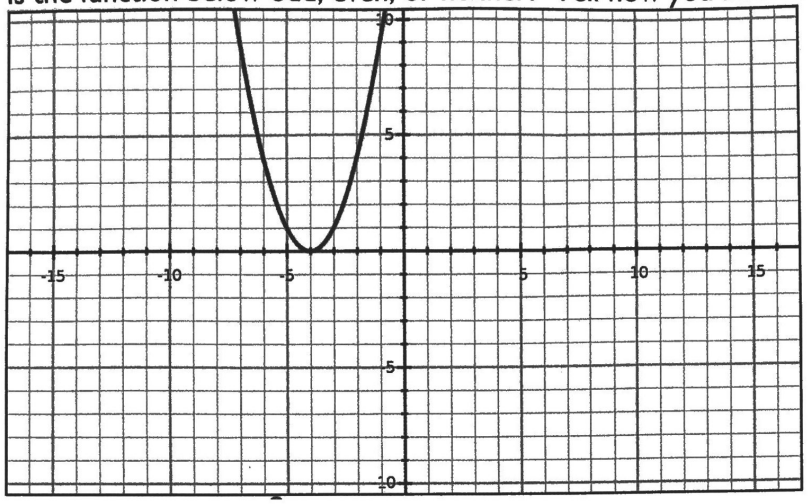
$0 = (x-10)(x-2)$

$x = 2$ or 10

$(2, -3)$ and $(10, 5)$

Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

2) Is the function below odd, even, or neither? Tell how you know that this is true. (2pts)



Neither. It does not have rotational symmetry about the origin (odd), nor does it have line symmetry with respect to the y-axis (even).

$f(x) \neq f(-x)$ and $-f(x) \neq f(-x)$

3) Find the equation of the polynomial with zeroes at $\sqrt{3}$ and $5i$ (2pts)

$y = (x+\sqrt{3})(x-\sqrt{3})(x+5i)(x-5i)$

$y = (x^2-3)(x^2-5i^2)$

$y = (x^2-3)(x^2+5)$

$\boxed{y = x^4+2x^2-15}$

Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

4) Bacteria in a petri dish increase by 45% every hour. At the start of the experiment, the researchers have 20 bacteria cells.

a. Write an equation to model this situation. (4pts)

$b = 20(1.45)^h$

b. If this process continues, how many bacteria will there be by the 12th hour? (2pts)

1727.61

c. If this process continues, what is the **total number** of bacteria cells that will have grown by the end of the 12th hour? (4pts)

hour	bacteria
0	20
1	29
2	42.05
3	60.97
4	88.41
5	128.19
6	185.88
7	269.53
8	390.82
9	566.69
10	821.69
11	1191.46
12	1727.61

5522.29

d. Let h = the number of hours, and b = the number of bacteria. Write an equation to find h in terms of b. Use the form $h =$ _____. (4pts)

$b = 20(1.45)^h$

$\frac{b}{20} = 1.45^h$

$\log\left(\frac{b}{20}\right) = h \log 1.45$

$h = \frac{\log \frac{b}{20}}{\log 1.45}$

e. After how many hours will there be 2000 bacteria? You must show this in terms of the equation you wrote in order to get full credit. You may round to the nearest hundredth of an hour. (2pts)

$2000 = 20(1.45)^h$

$100 = 1.45^h$

$\log 100 = h \log 1.45$

12.39 hours = h

$h = \frac{\log \frac{b}{20}}{\log 1.45}$

$h = \frac{\log 100}{\log 1.45}$

Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

5) Solve each equation below: (3pts each)

a. $3x^2 - 11x + 5 = 0$

$3x^2 - 11x = -5$

$x^2 - \frac{11}{3}x = -\frac{5}{3}$

$(x - \frac{11}{6})^2 = -\frac{5}{3} + \frac{121}{36}$

$(x - \frac{11}{6})^2 = \frac{61}{36}$

$x - \frac{11}{6} = \pm\frac{\sqrt{61}}{6}$

$x = \frac{11 \pm \sqrt{61}}{6}$

b. $7\log_8 2x = 6$

$\log_8 2x = \frac{6}{7}$

$8^{\frac{6}{7}} = 2x$

$x = 2.972$

c. $2(3^{2x} - 12) = 82$

$3^{2x} - 12 = 41$

$3^{2x} = 53$

$2x \log 3 = \log 53$

$2x = \frac{\log 53}{\log 3}$

$x = 1.807$

d. $(3x-1)^{\frac{4}{5}} = 256$

$\left((3x-1)^{\frac{4}{5}}\right)^{\frac{5}{4}} = 256^{5/4}$

$3x-1 = 1024$

$x = 341\frac{2}{3}$

e. $\left(\sqrt{2x-7}\right)^2 = (x-3)^2$

$2x-7 = x^2-6x+9$

$0 = x^2-8x+16$

$\boxed{x=4}$

6) Simplify $\sqrt[3]{54x^5}$ (2pts)

$\sqrt[3]{3^3 \cdot 2 \cdot x^5}$

$\boxed{3x\sqrt[3]{2x^2}}$

Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

7) The following problems are not exactly what the ones on your test will be, but there will be a series of questions about quadratic functions.

a. Prove that the y-value of the vertex of a quadratic function is $\frac{-b^2+4ac}{4a}$. Show your work. (2pts)

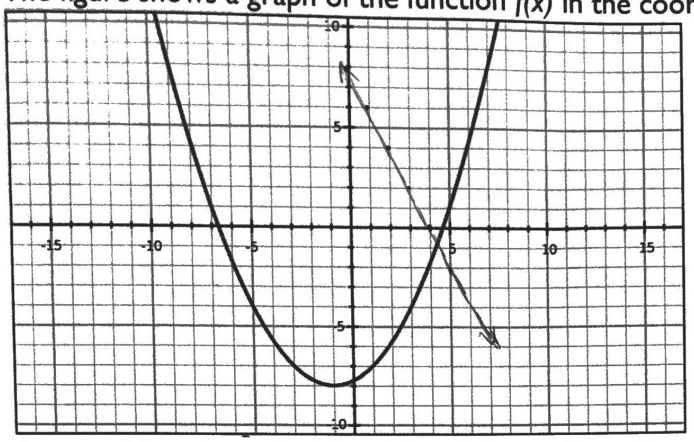
See test #1 answer key

b. How can you determine from an equation if a quadratic function will have real or imaginary zeroes? (3pts)

c. Which of the coefficients or constants in a quadratic function **cannot** be zero: a, b, or c? Why? (2pts)

Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

8) The figure shows a graph of the function $f(x)$ in the coordinate plane.



A second function g, is defined by $g(x) = -2x + 8$.

a. Which is greater, $f(2)$ or $g(2)$? (2pts)

b. Which is greater, $f(0)$ or $g(0)$? (2pts)

9) Multiply $(4 - 3i)(6 + i)$ (2pts)

a. Multiply $(4 - 3i)(6 + i)$

$24 - 14i - 3i^2$

$27 - 14i$

b. Find the equation of the quadratic function that has a zero at $3+2i$.

$(x - 3 + 2i)(x - 3 - 2i)$

$x^2 - 3x - 2xi - 3x + 9 + 6i + 2xi - 6i - 4i^2$

$y = x^2 - 6x + 13$

10) Simplify $81^{3/4}$ (2pts)

$(\sqrt[4]{81})^3$

27

Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

11) Expand by using the properties of logarithms to rewrite the following expressions as a sum: (2pts)

$$\log \frac{4x}{y^3}$$

$(\log 4 + \log x) - 3\log y$

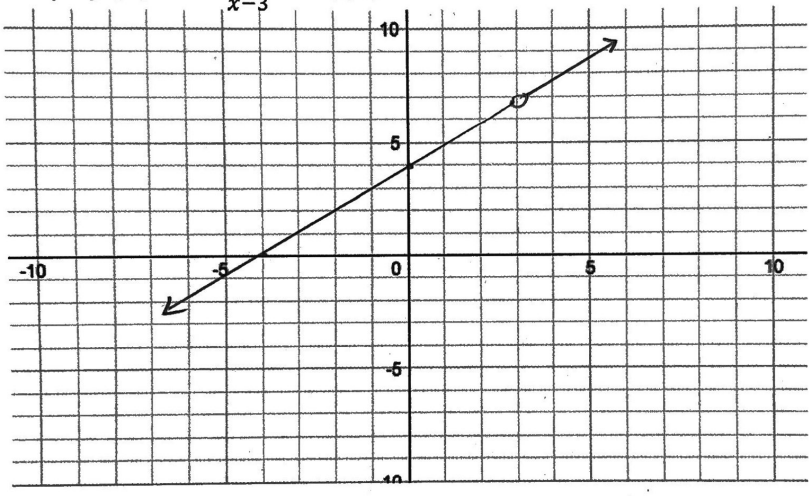
12) Condense the following expression: (2pts)

$3 \log_5 x + 4\log_5 z$

$\log_5 x^3 z^4$

13)

a. Graph $f(x) = \frac{x^2+x-12}{x-3}$ (3pts)



$\frac{(x+4)(x-3)}{(x-3)}$

$y = x+4$

b. What is an asymptote? Tell what it is, not where they are on this graph. (3pts)

An asymptote is a value that a function approaches as one variable approaches a value or approaches infinity.

c. Which part of the rational function controls the vertical asymptote?

The denominator

d. Suppose you try to solve $x^2 + x - 12$, in the context of this problem. What is the name of the point you have found? Why is in important? (2pts)

That point is the x-intercept

Algebra 2 Honors Final Exam 2017 – 2018 PRACTICE TEST 2

14) Simplify. Make sure to state any restrictions on the variables. (3pts)

$$\frac{x}{x^2+5x+6}+\frac{2}{x^2+3x+2}$$

15) Simplify. Make sure to state any restrictions on the variables. (3pts)

$$\frac{x+1}{x^2-2x-35}-\frac{x+6}{x^2+7x+10}$$

14) $\frac{x}{x^2+5x+6} + \frac{2}{x^2+3x+2}$

$\frac{x}{(x+2)(x+3)} + \frac{2}{(x+1)(x+2)}$

$\frac{x(x+1)}{(x+1)(x+2)(x+3)} + \frac{2(x+3)}{(x+1)(x+2)(x+3)}$

$\frac{x^2+x}{(x+1)(x+2)(x+3)} + \frac{2x+6}{(x+1)(x+2)(x+3)}$

$\frac{x^2+3x+6}{(x+1)(x+2)(x+3)}$

$x \neq -1, -2, -3$

15) $\frac{x+1}{(x+5)(x-7)} - \frac{x+6}{(x+5)(x+2)}$

$\frac{(x+1)(x-2)}{(x+5)(x+2)(x-7)} - \frac{(x+6)(x-7)}{(x+5)(x+2)(x-7)}$

$\frac{(x^2-x-2)}{(x+5)(x+2)(x-7)} - \frac{(x^2-x-42)}{(x+5)(x+2)(x-7)}$

$\frac{40}{(x+5)(x+2)(x-7)}$